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DIGITAL COMPUTER PROGRAMS FOR THE COST ENGINEER

Environmental Protection Agency
Cincinnati, Ohio

March 1971

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DIGITAL COMPUTER PROGRAMS

FOR

THE COST ENGINEER

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Springfield VA 22151

ENVIRONMENTAL PROTECTION AGENCY
Water Quality Office
Advanced Waste Treatment Research Laboratory
Cincinnati, Ohio

March 1971

Proc. 130

PROGRAM NUMBER:

PROGRAM TITLE: A Generalized Computer Model for Steady-State Performance of the Activated Sludge Process (CSSAS)

DESCRIPTION:

This generalized computer model for the activated sludge process provides for simulation of all aspects of the process. The model has been shown to fit data from a wide range of process modifications from the short detention time, low mixed liquor suspended solids "modified process" to the "extended aeration process". In using this model to fit experimental data it was discovered that the maximum rate constant for synthesis normally taken as a constant varies significantly with process loading.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Complete description of model in FWQA publication, "A Generalized Computer Model for Steady-State Performance of the Activated Sludge Process". Report and source deck available at no charge.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Cost Estimating Computer Program for Wastewater Treatment Plants

DESCRIPTION:

Capital, amortization, operation and maintenance and total treatment costs are calculated for wastewater treatment plants based on the processes and process equipment that is used. It is possible to input an amortization factor, construction cost index and hourly wage rates. The cost calculations are made from various standard design parameters that are input to the program. Rules of thumb relationships are used to size equipment structures and internal streams.

COMPUTING SYSTEM: IBM 1130/16K

AVAILABILITY: Documentation and source deck available at no cost.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Economic Evaluation of Municipal Water Supply and Wastewater Disposal Including Considerations of Seawater Distillation and Wastewater Renovation

DESCRIPTION:

This digital computer model can be utilized in determining the least-cost alternative for meeting major water demand and wastewater disposal requirements within a metropolitan area. The mathematical model is comprised of three basic components: (1) the preprocessing program, (2) the network program, and (3) the recosting program. The network program is based on integer linear programming and uses the "out-of-kilter" algorithm. The preprocessing program is used to calculate unit costs for each arc of the network. The recosting program is used to correct for the fact that costs are not linear with size.

COMPUTING SYSTEM: GE 635

AVAILABILITY: Descriptive report and source deck available at no cost.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Executive Program for Preliminary Design of Wastewater Treatment Systems

DESCRIPTION:

The purpose of the Executive Program is to allow the designer to select the group of treatment processes and to arrange the interprocess piping in any way. To use the program the designer first makes a flow diagram of the system to be studied. Process symbols are used to make sure that the correct number of influent and effluent streams for each process are included in the diagram. All streams are numbered by the process designer and the input to the Executive Program is prepared to communicate the flow diagram to the program. A list of decision variables is supplied as input to the program. By iterative techniques the Executive Program then calls each process subroutine in turn and recomputes all recycle streams until the correct solution is found. Performance and cost for each process and for the system as a whole is computed and printed.

COMPUTING SYSTEM: IBM 1130/16K

AVAILABILITY: A report entitled, "Executive Digital Computer Program for Preliminary Design of Wastewater Treatment Systems", No. WP-20-14 is available along with the source deck at no charge.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Math Model for Complete Secondary Treatment System

DESCRIPTION:

This digital computer program is a design and costing computational procedure for the conventional treatment system including primary settling, activated sludge, sludge thickening, anaerobic digestion of primary and waste activated sludge, sludge elutriation, vacuum filtration of sludge, sludge incineration and sludge drying beds. A stream vector for raw municipal sewage is supplied as input to the program. One or more decision parameters for each process is supplied as input. The program computes the stream vector for all streams in the system and computes the construction cost and the operating and maintenance cost for each process and for the system. Total costs for the entire system are presented in the documentation with some limited optimization studies.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: A report entitled "Preliminary Design and Simulation of Conventional Wastewater Renovation Systems Using the Digital Computer", No. WP-20-9 is available along with the source deck at no charge.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Mathematical Model for the Electrodialysis Process

DESCRIPTION:

This digital computer program can be used to design the electrodialysis process for removing dissolved salts from renovated wastewater. The fraction of the dissolved salts to be removed is supplied as input with the volume of the feed stream. The volume of the concentrate stream is calculated with the electrical power demand and the amount of chemicals needed. Capital cost as well as operating and maintenance cost are calculated as part of the design calculation.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Report and source deck available at no cost.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Mathematical Model for Lime Recalcination

DESCRIPTION:

This digital computer program designs, sizes, and estimates the cost of a fluidized bed process for recalcination of lime recovered from the lime clarification process for tertiary treatment of municipal wastewater. Experimental data used to develop empirical design relationships were from pulp and paper plants and water softening plants.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Report and source deck available at no cost.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Mathematical Model for Reverse Osmosis

DESCRIPTION:

This digital computer program uses empirical relationships to size a particular kind of reverse osmosis equipment for removing particulate and dissolved salts from wastewater. The cost of installing equipment and the cost of operating and maintaining the equipment are calculated as part of the design exercise.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Report and source deck available at no cost.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Mathematical Model of Sewage Sludge Fluidized Bed Incineration

DESCRIPTION:

This digital computer program is used to design and estimate the cost of installing, operating, and maintaining a fluidized bed incinerator. The program computes mass and heat balances as well as deriving empirical relationships for sizing of equipment.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Development of program described in FWQA Report No. TWRC-10 entitled, "Mathematical Model of Sewage Sludge Fluidized Bed Incinerator Capacities and Costs". Report and source deck available at no cost.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Mathematical Model for Tertiary Treatment by Lime Addition

DESCRIPTION:

This program computes the size of process equipment, the amount of chemicals, electrical power, operating and maintenance labor, etc., for the lime clarification process used downstream of the activated sludge process. Capital cost associated with installing the process and operating and maintenance cost are computed.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Robert A. Taft Water Research Center Report No. TWRC-14 and source deck available at no cost.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER

PROGRAM TITLE: Time-Dependent Computer Model for the Activated Sludge Process

DESCRIPTION:

This digital computer program consists of a numerical integration with respect to time of the rate of synthesis and mass balance equations for each of the aeration sub-volumes and for the process as a whole. Three classes of microorganisms are considered; heterotrophs which convert biodegradable carbon to new cells, Nitrosomonas which converts nitrite to new cells and nitrate, and Nitrobacter which converts nitrite to new cells and nitrate. This model has been used to investigate a number of schemes for automatic control of the activated sludge process. The program has provisions for printing process variables at each time point and for electro-mechanical plotting.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Report entitled, "Simulation of the Time-Dependent Performance of the Activated Sludge Process Using the Digital Computer" available with source deck at no cost.

DIRECT INQUIRIES TO: Mr. R. G. Eilers
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: A Mathematical Model for Ammonia Stripping

DESCRIPTION:

The ammonia stripping from wastewater is simulated mathematically. Based on the desired ammonia removal, a preliminary design of the tower is calculated. The model considers the effect of temperature drop throughout the stripping tower. Capital, operating and maintenance costs are also calculated.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Complete description of model in report entitled, "Mathematical Simulation of Ammonia Stripping Towers for Wastewater Treatment". Report and source deck available at no charge.

DIRECT INQUIRIES TO: Mr. Joseph Roesler
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: A Mathematical Model for a Waste Stabilization Pond

DESCRIPTION:

The model estimates preliminary design data for aerobic waste stabilization ponds. Parameters that influence the design are temperature of the water, D.O. Level, sunlight radiation, amount of rain or evaporation and desired BOD removal. Capital, operating and maintenance costs are also calculated.

COMPUTING SYSTEM: IBM 1130 8K

AVAILABILITY: Report and source deck available at no charge.

DIRECT INQUIRIES TO: Mr. Joseph Roesler
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Mathematical Model for Microscreen Process

DESCRIPTION:

Microscreening of wastewater is simulated mathematically. The computer program generates preliminary design data for a given BOD and TDS removal. Capital, operating and maintenance costs are also included.

COMPUTING SYSTEM: IBM 1130/8K

AVAILABILITY: Report and source deck available at no charge.

DIRECT INQUIRIES TO: Mr. Joseph Roesler
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Mathematical Model for a Trickling Filter

DESCRIPTION:

The mathematical model of the trickling filter-final settling process computes the relationship of the various physical properties of the trickling filter and the final settler necessary for preliminary design based on the desired BOD removals. The model also includes capital, operating and maintenance costs for the trickling filter, final settler and return pumps.

COMPUTING SYSTEM: IBM 360-65

AVAILABILITY: A report entitled, "A Mathematical Model for a Trickling Filter", No. W69-2 is available along with the source deck at no charge.

DIRECT INQUIRIES TO: Mr. Joseph Roesler
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: Mathematical Model for Wastewater Treatment by Ion Exchange

DESCRIPTION:

This digital computer program is used to design the ion exchange process for removing dissolved salts from renovated wastewater. One part of the program calculates the non-steady performance of the process with respect to time. Another part of the program uses gross design methods to size the equipment associated with the process. Capital cost and operating and maintenance cost estimates are made based on the design conditions.

COMPUTING SYSTEM: IBM 360-65

AVAILABILITY: Documentation and source deck available at no cost.

DIRECT INQUIRIES TO: Mr. Joseph Roesler
Advanced Waste Treatment Research Laboratory
4676 Columbia Parkway
Cincinnati, Ohio 45226

PROGRAM NUMBER:

PROGRAM TITLE: COSTS

DESCRIPTION:

Job cost accounting for payroll and expenses. COSTS is a comprehensive program for payroll and job cost accounting for an engineering or business firm. Job numbers, work code numbers, employee salary data, pay period time sheet data, and job expense data constitute the input data. Output data consist of many types of cost reports.

COMPUTING SYSTEM:

AVAILABILITY: Fixed fee per job, input data transmitted by mail or by remote computer terminal, fee schedule supplied upon request

DIRECT INQUIRIES TO: OMNIDATA
110 East 42 Street
New York, NY
Telephone 212/986-3786

PROGRAM NUMBER:

PROGRAM TITLE: ESTRE

DESCRIPTION:

Estimate reports for engineering and construction projects. ESTRE can store the item number, item description and unit price of all material and work items in a project. With the entry of input data for quantities of the items at any specified period, ESTRE can be used to issue estimate reports according to various breakdown of sub-contractors or work agencies. Another important function of ESTRE is to keep track of all the previously reported quantities in permanent disk files for updating purposes.

COMPUTING SYSTEM:

AVAILABILITY: Fixed fee per job, input data transmitted by mail or by remote computer terminal, fee schedule supplied upon request

DIRECT INQUIRIES TO: OMNIDATA
110 East 42 Street
New York, NY
Telephone 212/986-3786

PROGRAM NUMBER:

PROGRAM TITLE: PAYRL

DESCRIPTION:

A comprehensive payroll system developed for a contractor's use. A minimum amount of input posted on fixed format input sheets enables a single person to post payrolls as large as 500 employees. This system develops various output reports which minimize the amount of clerical help necessary to process the payroll. The reports include:

Weekly:
1. Payroll Register Index
2. Earnings and check register
3. Personalized Payroll Check
4. Payroll Summary By Trade Per Job
5. Master Employee List
6. New Hire List
7. Labor Cost Summary
8. Next Week's Work Sheets

Monthly:
1. Individual Employee Earnings Card
2. Union Report
3. Master List of Employee's Earnings

Quarterly:
1. Internal 941A Check Sheet
2. 941A Continuation Sheet

Annually:
1. W-2 Forms Preparation
2. W-2 Supporting Tapes

The total service concept of this system is further enhanced by the ability to use it as data input to a job or task oriented cost control system.

This system, developed by Comtec Service Bureau Inc., is available through Omnidata's Data Center and is currently being used on the World Trade Center and Co-op City among many other projects.

COMPUTING SYSTEM:

AVAILABILITY: Fixed fee per job, input data transmitted by mail or by remote computer terminal, fee schedule supplied upon request

DIRECT INQUIRIES TO: OMNIDATA
110 East 42 Street
New York, NY
Telephone 212/986-3786

PROGRAM NUMBER:

PROGRAM TITLE: 1130 PCS (1130 Project Control System)

DESCRIPTION:

This program will process data from networks planned in either precedence-diagramming or arrow-diagramming (Critical Path Method) methods. Output reports include status listings, bar charts, and basic resource and cost summarization reports. Updating capability is provided for network restructuring as well as progress reporting for in-process work items. 1130 PCS is an IBM Application Program.

COMPUTING SYSTEM:

AVAILABILITY: Fixed fee per job, input data transmitted by mail or by remote computer terminal, fee schedule supplied upon request.

DIRECT INQUIRIES TO: OMNIDATA
110 East 42 Street
New York, NY
Telephone 212/986-3786

PROGRAM NUMBER:

PROGRAM TITLE: SEW NET

DESCRIPTION:

A series of integrated computer programs for the design of a sanitary sewer system. As developed, the total system includes five major programs which may be linked when a comprehensive design study and report are required, or may be used separately if desired. The major programs include (1) estimation of design flows (2) design of sewers (3) computation of partial flow characteristics (4) estimate costs (5) plotting of field data and final sewer design. The first linked major program computes the flow to each sewer link. The sewer design program sets minimum depth of sewer to satisfy service requirements, finds minimum slopes to satisfy minimum-velocity criteria and logic to minimize the necessary cut. The partial flow program automatically gives the depth and velocity of any flow specified. The estimate of costs programs is in some ways the most significant because of the ultimate importance of the cost of the project. The detailed format of the cost estimate output permits the engineer to examine such items as length of pipe of each size in each cut range required by a particular layout, and to observe the changes in any individual cost item which results from a change in the layout or other design factor.

COMPUTING SYSTEM:

AVAILABILITY: Fixed fee per job, input data transmitted by mail or by remote computer terminal, fee schedule supplied upon request

DIRECT INQUIRIES TO: OMNIDATA
110 East 42 Street
New York, NY
Telephone 212/986-3786

PROGRAM NUMBER:

PROGRAM TITLE: TMCDS

DESCRIPTION:

Accounting of computer time cards. TMCDS is written to process the monthly accounting of the amount of computer time used by the clients of Omnidata. TMCDS issues the invoices to the clients and also keeps a permanent record of computer time usage for the clients from month to month. TMCDS may be used to serve similar functions where periodic invoicing and updating of time accounting are required.

COMPUTING SYSTEM:

AVAILABILITY: Fixed fee per job, input data transmitted by mail or by remote computer terminal, fee schedule supplied upon request

DIRECT INQUIRIES TO: OMNIDATA
110 East 42 Street
New York, NY
Telephone 212/986-3786

PROGRAM NUMBER:

PROGRAM TITLE: Computer Record of Outlying Flow Tabulations (CROFT)

DESCRIPTION:

This program stores and tabulates flow data at outlying sewage pumping stations. The complete tabulation is reported, weekly, monthly, and annually. The computer program saves over $1,200 in man-hours annually. Accompanying the savings are the following advantages: (1) Reduction of math errors and accurate billing, (2) Ability at any time during year to rapidly obtain any week, month, or accumulative total for any one of 25 separate stations, (3) In the absence of meter readings (malfunction of meter), an estimate is automatically entered into the total and noted, (4) A subprogram is provided to check each weekly flow rate against preset limits. If value is outside of established limits, notation is made.

COMPUTING SYSTEM: IBM 1130/16K

AVAILABILITY:

DIRECT INQUIRIES TO: Mr. C. F. Guarino, Deputy Commissioner
Philadelphia Water Department
1160 Municipal Services Building
Philadelphia, Pa. 19107

PROGRAM NUMBER:

PROGRAM TITLE: MEDICO

DESCRIPTION:

MEDICO serves as a management tool to evaluate, control and direct maintenance in waste treatment. The program prints out on a weekly, monthly, and annual basis, the maintenance status of over 190 pieces of machinery. In the report equipment is grouped according to station (plant location) and includes the following information: (1) hours available (2) hours operated (3) hours out of service (4) reason for downtime (5) percent of time unavailable (6) hours unavailable to date. Item (4) is detailed by the use of a letter code: M for mechanical, E for electrical, D for diagnostic, I for instrumentation, C for contract work, and O for operational problems. Thus, the creation of the acronym MEDICO. Accomplishments of MEDICO are (1) precise history of equipment utilization (2) ability to determine at any time, the hours a specific piece of equipment has been down for the calendar year or since its installation (3) type of maintenance crucial to specific equipment (4) ability to tie in treatment efficiency with equipment outage (5) relays vital information to a manager in a short span of time (6) budget request verification.

COMPUTING SYSTEM: IBM 1130/16K

AVAILABILITY:

DIRECT INQUIRIES TO: Mr. C. F. Guarino, Deputy Commissioner
Philadelphia Water Department
1160 Municipal Services Building
Philadelphia, Pa. 19107

PROGRAM NUMBER:

PROGRAM TITLE: Northeast Log NELOG

DESCRIPTION:

The data logging program named NELOG has been used by the Philadelphia Water Department since January, 1967, to reduce the time required for record keeping, minimize human errors, analysis of plant performance data which would be impractical if attempted manually. The NELOG program evaluates the data and produces an output showing deviations considered normal or acceptable for plant performance. This report is brief and enables the technical personnel to review and/or correct questionable data. Records are improved furnishing data which is being used to gain a better understanding of the operation of the sewage treatment plant as a whole, as well as a better understanding of the treatment processes.

COMPUTING SYSTEM: IBM 1130/16K

AVAILABILITY:

DIRECT INQUIRIES TO: Mr. C. F. Guarino, Deputy Commissioner
Philadelphia Water Department
1160 Municipal Services Building
Philadelphia, Pa. 19107

PROGRAM NUMBER:

PROGRAM TITLE: CØ$T* (Cost Oriented Systems Technique)

DESCRIPTION:

The CØ$T* System is a computerized chemical processing plant cost estimating system which cuts process design and cost estimating time requirements from man-months to man-hours. In addition, the computer system output is in English language and consists of a profit projection and a fixed capital cost estimate, immediately useful to corporate managers and planners, instead of numeric tabular output requiring analysis and interpretation. Inherent system features permit the engineer to postulate alternate processing schemes and obtain comparative results at minimum time and expense.

The System handles the chemical processing plant as a modular series of operational units and contains extensive files of equipment and material cost data which is updated annually. It also estimates maintenance and operation costs for complete economic evaluation and compares its own results to classical cost estimating techniques such as those of C. A. Miller and H. J. Lang while also affording opportunities for the engineer to insert both known values and judgment factors. Fixed capital and profit projections can be obtained for a variety of situations limited only by such realistic considerations as the number of processes by which a product can be manufactured, the quantities in which it can be consumed and the price for which it can be profitably marketed.

COMPUTING SYSTEM: IBM System 360, Univac 1108/59K

AVAILABILITY: Can be purchased for $21,000 or leased at $500/month

DIRECT INQUIRIES TO: ICARUS Corporation
13125 Clifton Road
Silver Spring, Maryland 20904

PROGRAM NUMBER:

PROGRAM TITLE: Complete Domestic Waste Treatment System Design
CC071

DESCRIPTION:

This design and costing program was developed using Dorr-Oliver design concepts and the program contains design and equipment sizing relationships for three separate process systems: ABC System for Complete Mixed Activated Sludge, PEP System for Phosphorus Removal and Farrer + FS Disposal for sludge dewatering and incineration. Volume flow and waste concentration of the influent stream is supplied as input. The program sizes all equipment and structures, computes the volume of all side streams and the consumption of electrical power and chemicals. Equipment cost estimates available separately.

COMPUTING SYSTEM: Program available only at Dorr-Oliver, Stamford, Conn.

AVAILABILITY: Computations using the program are made at no charge to the customer by Dorr-Oliver

DIRECT INQUIRIES TO: Dorr-Oliver Inc.
77 Havemeyer Lane
Stamford, Conn 06904

Environmental Equipment and Systems Div.
Attention: Marketing Department

PROGRAM NUMBER:

PROGRAM TITLE: Envirotech Municipal Equipment Program

DESCRIPTION:

This program provides the consulting engineer with a complete equipment analysis of his sewage plant system in minutes. The program requires at least three, but can use up to 1000 variables for determining engineering and cost parameters of a modeled primary-secondary treatment system. Preliminary computer output provides equipment sizing, capital costs, operating costs and engineering data for the complete system model. At this point, the engineer could then feed the computer modified or additional input data, providing alternatives in cost and performance readout information.

COMPUTING SYSTEM: Terminal System - Terminal provided in consulting engineer's office

AVAILABILITY: Monthly fee

DIRECT INQUIRIES TO: Mr. Robert Sherwood
Municipal Equipment Div.
Envirotech Corporation
100 Valley Drive
Brisbane, California 94005

PROGRAM NUMBER:

PROGRAM TITLE: Regional Air Pollution Analysis (RAPA)
Alternative Title: Implementation Planning Program, IPP)

DESCRIPTION:

RAPA is composed of a number of individually well developed sub-models linked together to permit comprehensive regional analyses. Regional meteorological and a source emission inventory are fed to an atmospheric transport and diffusion model. The model calculates the annual or seasonal pollution concentration existing throughout the region. The difference between the ambient pollution concentration and the air quality standard can be expressed as emission reductions required at the contributing sources to achieve the standard. A control strategy model is used to find the most cost-effective method of reducing the ambient concentrations to meet the standards. A cost-effective model generates cost and performance estimates. The cost-effectiveness model consists of calculations of (1) annualized cost and (2) the controlled emission rate of each type of control measure applied to each applicable type of source. The control strategy model sequentially examines each source in the region, selects the proper control measure, and generates a control cost summary and an effectiveness of the applied controls in achieving the ambient air quality.

COMPUTING SYSTEM: IBM 360 Model 40 or larger

AVAILABILITY: April 1971

DIRECT INQUIRIES TO: Jack Former
Air Pollution Control Office
Mutual Plaza Building
411 W. Chapel Hill Street
Durham, N.C. 27701